Name of Organization: Minnesota Pollution Control Agency

Type of Organization: State

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Project Title: Sediment Remediation Scoping Project: Minnesota Slip, MN

Project Category: Contaminated Sediments

Rank by Organization (if applicable): 0

Total Funding Requested ($) 128,600.00 **Project Duration:** 1 Years

Abstract:

The Minnesota Pollution Control Agency (MPCA) proposes to conduct a sediment remediation scoping project in Minnesota Slip (Duluth, MN Harbor) that will further the development of remediation options for this site. Sediment contamination is of concern in this slip due to moderately high levels of bioaccumulative contaminants [e.g., polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and mercury]. In addition, Minnesota Slip is located near the Duluth entry to Lake Superior and may serve as a source of contaminants to this pristine lake. The MPCA proposes to build on the results of previous weight-of-evidence investigations in Minnesota Slip (i.e., total of 7 sample stations) to conduct more detailed sediment sampling and concurrent toxicity tests. This will allow for the volume of contaminants to be estimated and for any associated acute and chronic effects to be documented. Contaminant concentrations will be compared to newly developed Sediment Quality Guidelines for the St. Louis River Area of Concern (GL 985604-01) to assist in the development of clean-up goals. A short-list of remediation scenarios for this orphan site will also be developed.

Geographic Areas Affected by the Project

States:

- ☐ Illinois
- ☐ Indiana
- ☐ Michigan
- ☒ Minnesota
- ☐ New York
- ☐ Ohio
- ☐ Pennsylvania
- ☐ Wisconsin

Lakes:

- ☒ Superior
- ☐ Huron
- ☐ Michigan
- ☐ Erie
- ☐ Ontario
- ☐ All Lakes

Primary Affected Area of Concern: St. Louis River, MN

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

The sediments in Minnesota Slip are contaminated with PAHs, PCBs, mercury, cadmium, chromium copper, lead, nickel, zinc, toxaphene, and p,p'-DDD and o,p'-DDT (Schubauer-Berigan and Crane, 1997; Crane et al., 1997). This slip had the highest PAH concentrations recorded in the MPCA's 1994 hotspot survey of the Duluth/Superior Harbor (Crane et al., 1997). A limited number of 10-day Hyalella azteca and Chironomus tentans tests have not revealed significant acute toxicity, although sediments from the most contaminated area of the slip were not tested. The surficial sediments are populated primarily with pollutant-tolerant oligochaetes. The contamination in this slip appears to be primarily from historical sources. Thus, there are no current potentially responsible parties responsible for this contamination. The MPCA requires additional information on the distribution of sediment contaminants, and potential for acute and chronic sediment toxicity, in Minnesota Slip so that a hotspot management plan can be developed for this site.

Proposed Work Outcome:

The MPCA proposes to conduct more detailed sediment sampling in Minnesota Slip. The contaminant data from this project will be combined with previous data sets to allow kreiging to be used to generate three-dimensional profiles of sediment contamination. The inclusion of toxicity testing will provide more detailed information on the potential for acute and chronic effects from exposure to surficial sediments. The main outcome of this project will be the development of a hotspot management plan for this slip. The major components of this project are as follows.

Sediment Chemistry

Sediment chemistry parameters will include the following contaminants: PAHs, PCBs, mercury, toxaphene, simultaneously extractable metals (SEM), acid volatile sulfides (AVS), total organic carbon (TOC), and particle size. Field sampling will need to accommodate the anchorage of several boats. The northeastern side of the slip contains a small marina for tour boats and pleasure craft. Approximately one-third of the slip is occupied by the William Irvin, an ore boat, that is permanently docked in the slip as a tourist attraction. Sediment sampling will be attempted under the Irvin using divers. The draft of the Irvin is 3 m, whereas the water depth is

approximately 5 m; this should allow enough room for the divers to collect approximately four to five shallow sediment samples.

Surficial sediments (0-5 cm) will be collected from other sites using a modified drop corer. Deeper core sections will be collected using the R/V Mudpuppy's vibracorer in areas the boat can maneuver into. A smaller MPCA boat and a Livingston corer may be used in more confined open water areas It is anticipated that some portion of the following core segments will be analyzed for a suite of contaminants: 5-20 cm, 20-35 cm, 35-50 cm, and 50-65 cm. Most of the five stations sampled in 1994 from this slip had approximately 0.6 m long cores. Many of these cores were oily and contained a greater percentage of sand deeper down in the core and further out in the slip. Visual observations of the cores will be used to refine the contaminant analysis strategy (e.g., oily core sections will be analyzed for PAHs and PCBs).

Sediment Toxicity Tests

Sediment toxicity tests will be conducted on a subset of surficial samples (0-5 cm), particularly below the six known outfalls to the slip and around the center part of the slip where the highest levels of contaminants have been measured. It is anticipated that 28-day toxicity tests with H. azteca, which are followed with a 14-day exposure period in clean water to further assess reproduction, will be conducted. The endpoints for these tests will be survival, reproduction, and growth (e.g., total body length, antennal segment). In addition, either 10 or 14-day tests with either Chironomus tentans or C. riparius will be conducted to assess survival and growth (i.e., weight). Overlying water quality measurements of alkalinity, hardness, pH, dissolved oxygen, conductivity, and unionized ammonia will be made. As part of another GLNPO project (GL 985604-01), a few surficial sites in Minnesota Slip will be sampled during May 1998 for 28-day bioaccumulation tests with Lumbriculus variegatus.

Benthological Community

The benthological community will not be sampled as previous surveys have shown the slip is dominated with pollutant-tolerant oligochaetes (e.g., Tubificids and naidid oligochaetes).

Other Issues

The MPCA would like to conduct the field sampling during the second or third week of September 1998. We will require the use of the R/V Mudpuppy and crew for at least two to three days. In order to prepare contractual agreements, the MPCA would need to have the grant awarded by June 1, 1998.

A contaminant loading study will need to be conducted as a future phase of this project. The purpose of the loading study would be to determine contaminant loadings from the six storm sewer outfalls draining into Minnesota Slip. In addition, the MPCA needs to obtain confirmation of potential groundwater transport of contaminants into the boat slip from surrounding contaminated land. The MPCA will also need to assess the hydrodynamics and potential for sediment resuspension in the slip as part of any future plans to remediate this site. It was felt these issues would be best addressed in a separate pre-proposal to GLNPO at a future date.

Project Milestones:	Dates:
QAPP	08/1998
Field Sampling	09/1998
Sediment Toxicity Test results	12/1998
Analytical Chemistry results	03/1999
Kreiging of Compiled Data Sets	05/1999
Data Analysis	09/1999
Draft Report	02/2000
Final Report	05/2000

☐ Project Addresses Environmental Justice

If So, Description of How:

☒ Project Addresses Education/Outreach

If So, Description of How:

The results of this project will be used to educate the Sediment Contamination Work Group of the St. Louis River Remedial Action Plan (RAP), the Citizens Action Committee of the RAP, and the Harbor Technical Advisory Committee (HTAC) of the Metropolitan Interstate Committee (MIC). In addition, conference presentation(s) and a peer-reviewed publication will be used to disseminate the results of this project.

Project Budget:

	Federal Share Requested ($)	Applicant's Share ($)
Personnel:	20,000.00	3,960.00
Fringe:	4,000.00	792.00
Travel:	2,500.00	0.00
Equipment:	400.00	0.00
Supplies:	733.00	0.00
Contracts:	90,000.00	0.00
Construction:	0.00	0.00
Other:	2,500.00	0.00
Total Direct Costs:	120,133.00	4,752.00
Indirect Costs:	8,467.00	1,678.00
Total:	0.00	0.00
Projected Income:	0.00	0.00

Funding by Other Organizations (Names, Amounts, Description of Commitments):

5% of the entire project costs will be provided in cash or by in-kind contributions and other non-cash support from the MPCA. The MPCA will also provide additional staff time, as needed, beyond the salary amount designated in the above budget.

Description of Collaboration/Community Based Support:

Field support will be needed from GLNPO, and its contractors, for using the R/V Mudpuppy. Community-based support will be available from the City of Duluth, who are part owners of Minnesota Slip.